

NTK3043N

Power MOSFET

20 V, 285 mA, N-Channel with ESD Protection, SOT-723

Features

- Enables High Density PCB Manufacturing
- 44% Smaller Footprint than SC-89 and 38% Thinner than SC-89
- Low Voltage Drive Makes this Device Ideal for Portable Equipment
- Low Threshold Levels, $V_{GS(TH)} < 1.3$ V
- Low Profile (< 0.5 mm) Allows It to Fit Easily into Extremely Thin Environments such as Portable Electronics
- Operated at Standard Logic Level Gate Drive, Facilitating Future Migration to Lower Levels Using the Same Basic Topology
- These are Pb-Free Devices

Applications

- Interfacing, Switching
- High Speed Switching
- Cellular Phones, PDAs

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	20	V
Gate-to-Source Voltage		V_{GS}	± 10	V
Continuous Drain Current (Note 1)	Steady State	I_D	$T_A = 25^\circ\text{C}$	255
			$T_A = 85^\circ\text{C}$	185
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	285	
Power Dissipation (Note 1)	Steady State	P_D	$T_A = 25^\circ\text{C}$	440
			$t \leq 5$ s	545
Continuous Drain Current (Note 2)	Steady State	I_D	$T_A = 25^\circ\text{C}$	210
			$T_A = 85^\circ\text{C}$	155
			$T_A = 25^\circ\text{C}$	310
Power Dissipation (Note 2)		P_D	310	mW
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	400	mA
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode) (Note 2)		I_S	286	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds)		T_L	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size.

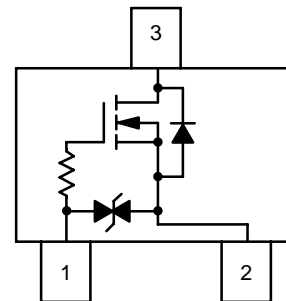


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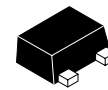
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D Max
20 V	1.5 Ω @ 4.5 V	285 mA
	2.4 Ω @ 2.5 V	
	5.1 Ω @ 1.8 V	
	6.8 Ω @ 1.65 V	

Top View

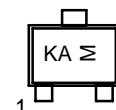


- 1 – Gate
- 2 – Source
- 3 – Drain

MARKING DIAGRAM



SOT-723
CASE 631AA



KA = Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
NTK3043NT1G	SOT-723*	4000 / Tape & Reel
NTK3043NT5G	SOT-723*	8000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

*These packages are inherently Pb-Free.

NTK3043N

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	280	°C/W
Junction-to-Ambient – $t = 5$ s (Note 3)	$R_{\theta JA}$	228	
Junction-to-Ambient – Steady State Minimum Pad (Note 4)	$R_{\theta JA}$	400	

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)
 4. Surface-mounted on FR4 board using the minimum recommended pad size.

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Test Condition	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 100$ μA	$V_{(BR)DSS}$	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$I_D = 100$ μA , Reference to 25°C	$V_{(BR)DSS}/T_J$		27		mV/°C
Zero Gate Voltage Drain Current	$V_{GS} = 0$ V, $V_{DS} = 16$ V	I_{DSS}	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	$V_{DS} = 0$ V, $V_{GS} = \pm 5$ V	I_{GSS}			1	μA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250$ μA	$V_{GS(TH)}$	0.4		1.3	V
Gate Threshold Temperature Coefficient		$V_{GS(TH)}/T_J$		-2.4		mV/°C
Drain-to-Source On Resistance	$V_{GS} = 4.5$ V, $I_D = 10$ mA	$R_{DS(ON)}$		1.5	3.4	Ω
			$V_{GS} = 4.5$ V, $I_D = 255$ mA	1.6	3.8	
			$V_{GS} = 2.5$ V, $I_D = 1$ mA	2.4	4.5	
			$V_{GS} = 1.8$ V, $I_D = 1$ mA	5.1	10	
			$V_{GS} = 1.65$ V, $I_D = 1$ mA	6.8	15	
Forward Transconductance	$V_{DS} = 5$ V, $I_D = 100$ mA	g_{FS}		0.275		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	$V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = 10$ V	C_{ISS}		11		μF
Output Capacitance		C_{OSS}		8.3		
Reverse Transfer Capacitance		C_{RSS}		2.7		

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5$ V (Note 4)

Turn-On Delay Time	$V_{GS} = 4.5$ V, $V_{DD} = 5$ V, $I_D = 10$ mA, $R_G = 6$ Ω	$t_{d(ON)}$		13		ns
Rise Time		t_r		15		
Turn-Off Delay Time		$t_{d(OFF)}$		94		
Fall Time		t_f		55		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{GS} = 0$ V, $I_S = 286$ mA	$T_J = 25^\circ\text{C}$	V_{SD}		0.83	1.2	V
		$T_J = 125^\circ\text{C}$			0.69		
Reverse Recovery Time	$V_{GS} = 0$ V, $V_{DD} = 20$ V, $dI_{SD}/dt = 100$ A/ μs , $I_S = 286$ mA	t_{RR}		9.1		ns	
Charge Time		t_a		7.1			
Discharge Time		t_b		2.0			
Reverse Recovery Charge		Q_{RR}		3.7			nC

5. Pulse Test: pulse width ≤ 300 μs , duty cycle $\leq 2\%$
 6. Switching characteristics are independent of operating junction temperatures

TYPICAL PERFORMANCE CURVES

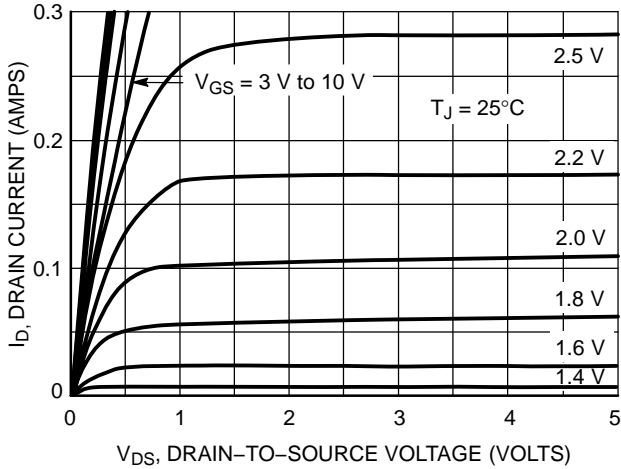


Figure 1. On-Region Characteristics

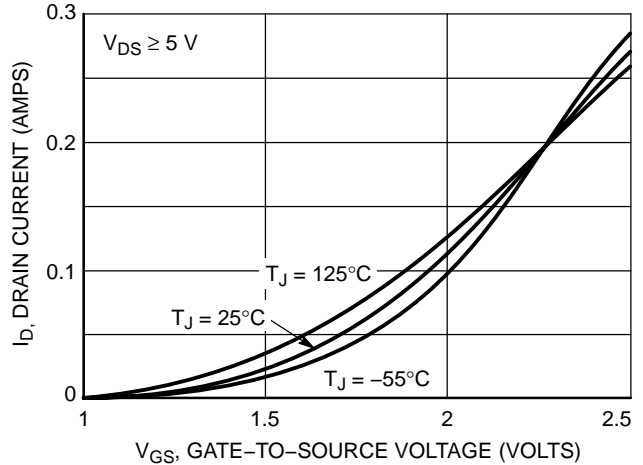


Figure 2. Transfer Characteristics

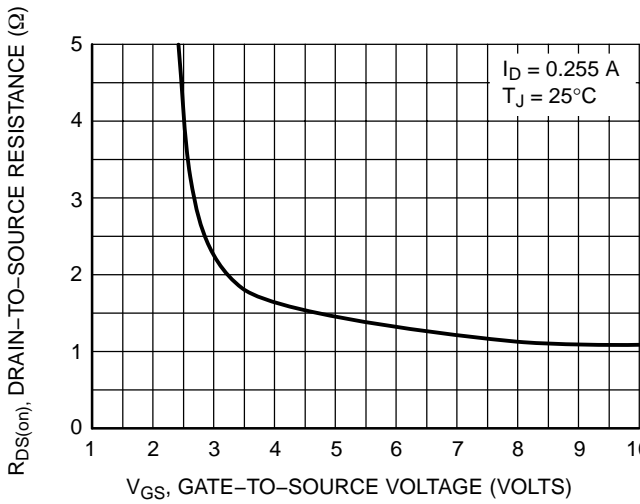


Figure 3. On-Resistance vs. Gate-to-Source Voltage

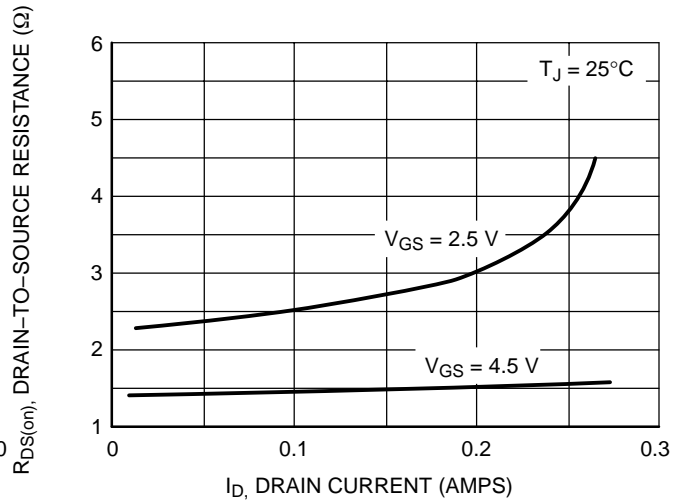


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

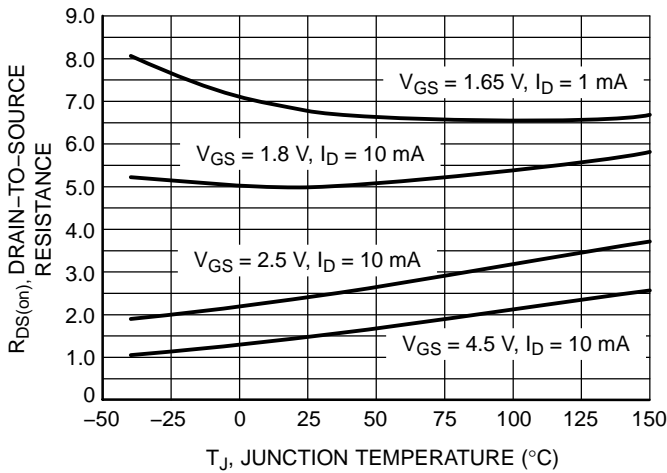


Figure 5. On-Resistance Variation with Temperature

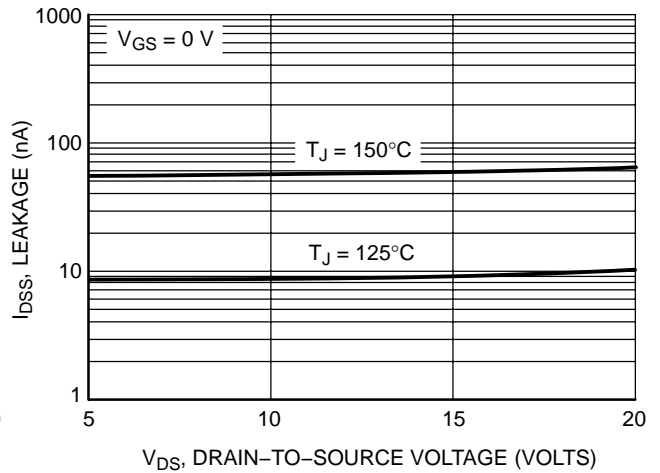


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

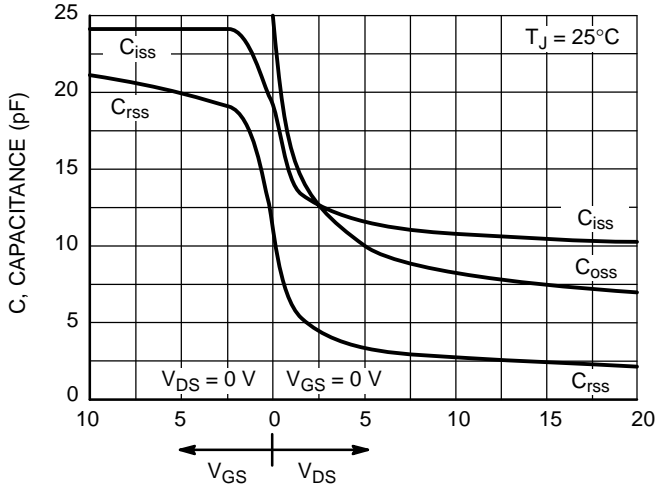


Figure 7. Capacitance Variation

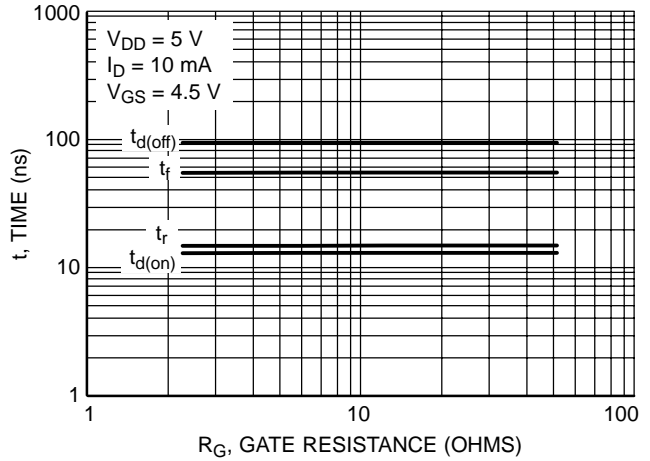


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

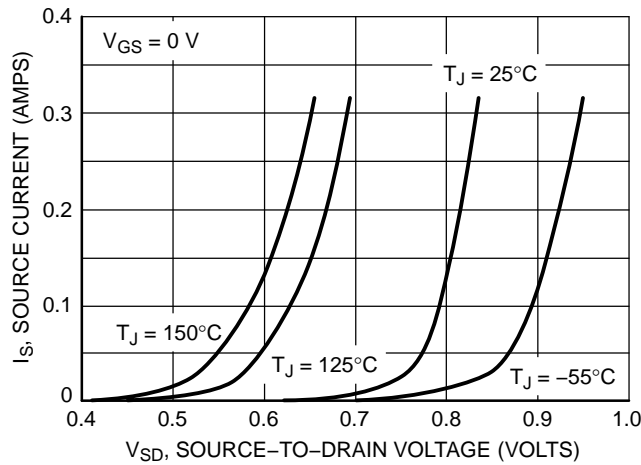
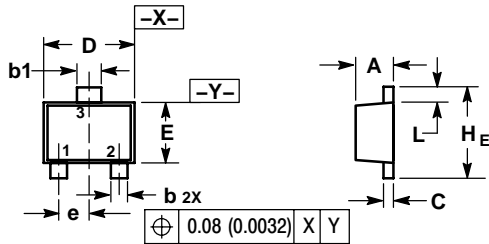


Figure 9. Diode Forward Voltage vs. Current

NTK3043N

PACKAGE DIMENSIONS

SOT-723
CASE 631AA-01
ISSUE B

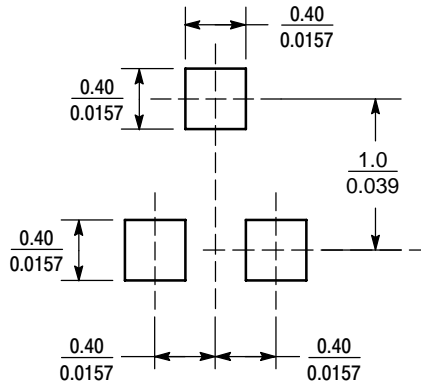


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.


DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.45	0.50	0.55	0.018	0.020	0.022
b	0.15	0.21	0.27	0.0059	0.0083	0.0106
b1	0.25	0.31	0.37	0.010	0.012	0.015
C	0.07	0.12	0.17	0.0028	0.0047	0.0067
D	1.15	1.20	1.25	0.045	0.047	0.049
E	0.75	0.80	0.85	0.03	0.032	0.034
e	0.40 BSC			0.016 BSC		
H E	1.15	1.20	1.25	0.045	0.047	0.049
L	0.15	0.20	0.25	0.0059	0.0079	0.0098

SOLDERING FOOTPRINT*



SCALE 20:1 $\left(\frac{\text{mm}}{\text{inches}} \right)$

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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